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Notes on North American Butterflies. 1.

parts by

Harry Pavulaan (editor)

ABSTRACT. New natural history elements and distribution records of several North American butterflies are reported. Taxonomy is often driven by geographical analyses. Cartography, coupled with internet-based imagery, opens up a promising wealth of information, allowing avocational researchers a tool by which inconvenient visits to institutional collections are no longer necessary for resolving some basic questions. While diversity and distribution of butterflies in North America are commonly believed to be fully known, the findings presented here show that much is yet to be learned of our butterfly fauna.

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Rhode Island, USA Fall Butterfly Survey 2023

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ABSTRACT: The second TILS-sponsored survey to document butterflies near season's end in Rhode Island was conducted Sept. 16 to Oct. 14. The goal was to document southward migrants as well as northward migrants, and also the presence and abundance of resident late season broods in the Ocean State.

INTRODUCTION

Near the southern New England coast, cool evenings around the beginning of fall generally signal the start of the Monarch (*Danaus plexippus*) migration westward through Rhode Island and Connecticut, then south to the overwintering grounds in Mexico. While this migration is well documented, several other species have been observed to migrate with them. Past observations by the coordinator in 1983 and 1984 confirmed a steady movement of Question Marks (*Polygonia interrogationis*) along the same route, but in considerably smaller numbers. This movement may be more akin to a localized movement of individuals to more hospitable overwintering conditions, perhaps along the coast southward, rather than a true migration. Reports from nearby Massachusetts indicate a similar movement among Mourning Cloak (*Nymphalis antiopa*) butterflies, but not yet observed in Rhode Island. The Painted Lady (*Vanessa cardui*) and Common Buckeye (*Junonia coenia*) have been anecdotally reported to migrate southward in fall along the Atlantic coast but this has not yet been verified. Observations indicate that these two species do congregate in large numbers along the coast in early fall, but no actual movement has yet been observed in Rhode Island. Likely most of these will perish with the onset of winter. Interestingly, no Question Marks or Buckeyes, normally common in the fall, were reported in 2023.

Rhode Island, as well as the rest of the southern New England coastal region, is known for its comparatively moderated temperate climate, compared to inland areas. Rhode Island winters are often tempered by proximity to the Atlantic Ocean and Narragansett Bay, though extreme cold spells are not uncommon. The progression of spring is delayed by several days or weeks, due to the fact that the ocean remains cold for several months into seasonal warmup. Summers are generally cooler overall than interior

New England regions, and afternoon sea breezes are a welcome relief on summer days, often many miles inland. Fall sees the reverse of spring, with frosts and freezes delayed several weeks due to proximity to the ocean, which retains its warmth for several weeks into the fall. This extended mild, frost-free period allows continued migration of northbound migrants such as *Phoebis sennae* (Cloudless Sulphur), *Panoquina ocola* (Ocola Skipper) and *Hylephila phyleus* (Fiery Skipper) annually, as well as infrequent migrants such as *Danaus gilippus* (Queen) and *Dione vanillae* (Gulf Fritillary). It also provides continued safe passage for southbound migrants, among which *Danaus plexippus* (Monarch) is best known.

The 2023 count, spanning Sept. 16 to Oct. 15, experienced a very mild period, with only a slight, steady decline in daily temperatures. High temperatures in Providence ranged from 61-81°F (16-27°C) over the period. Nighttime temperatures varied considerably, but remained mild, well above frost temperatures, ranging from 46-70°F (8-21°C). Rain occurred infrequently during September, but most rains were light.

SOURCES AND METHODS

Butterflies were recorded primarily by cellphone camera or other photographic means. Sight reports without images were accepted from reliable sources. Records were submitted either directly to the coordinator (Harry Pavulaan) via email or Facebook Messenger, while others were obtained from internet sources: iNaturalist, e-Butterfly and the Rhode Island Butterflies and Moths Facebook group. Records are attributed to the list of contributors below. Many contributors to iNaturalist use made-up pseudonyms instead of their real names. Those not identified by real name are listed anonymously under "IN" (iNaturalist):

AB = Ann Buerry Brown
BT = Bill Thompson
DG = David Gregg
DM = David Mozzoni via eButterfly
DS = Daniel Sullivan via iNaturalist
DT = Dee-Dee Taylor
IN = iNaturalist – anonymous
JN = Jacqui Bilodeau Nye
JO = Jim ONeill via iNaturalist
JS = Jim Sweeney via iNaturalist
KL = Karen Lee via iNaturalist
KM = Kent McFarland via iNaturalist, eButterfly
KT = Kerry Tehan
LB = Lucille Boyce
LY = Kevin Lynch via iNaturalist
MI = Paul Miller
MN = Michael Newton
NA = Jim Natale via iNaturalist
PM = Pat Molloy
SD = Sue Dunn
SF = Sandra Ferretti
SG = Sandra Gaumont
VM = Vanessa Massey

RESULTS BY BUTTERFLY FAMILY

All butterflies are listed under their respective Lepidopteran FAMILY (i.e. Papilionidae). Butterflies are listed in the sequence given in the Pelham (2008) Catalogue. A comment, indicating residency or migratory status, is provided. Observations of larvae are listed separately, in alphabetic order by genus, regardless of Lepidopteran family group. All records are by city or town (underlined).

PAPILIONIDAE

***Papilio polyxenes* (Black Swallowtail)** – resident.
Narragansett: 18 Sept. (AB) **1 -** Nectaring on *Solidago* sp. (Goldenrod).
South Kingstown: 3 Oct. (PM, SG) **2**

***Pterourus glaucus glaucus* (Eastern Tiger Swallowtail)** – resident.
Warwick: 17 Sept. (SD) **1 -** Nectaring on *Symphyotrichum novi-belgii*.

***Pterourus troilus troilus* (Spicebush Swallowtail)** – resident.
Barrington: 4 Oct. (IN) **1** – Fresh individual, indicating partial third brood.
South Kingstown: 17 Sept. (DG) **1 -** Nectaring on *Solidago* sp. (Goldenrod).

PIERIDAE

***Pieris rapae* (Cabbage White)** – resident.
Barrington: 21 Sept. (PM) **5 -** Nectaring on *Aster* sp. (Aster).
Bristol: 22 Sept. (PM) **15;** 3 Oct. (PM) **10**
Charlestown: 17 Sept. (MN) **4**; 2 Oct. (IN) **1**
East Providence: 17 Sept. (PM) **1**; 4 Oct. (PM) **10**; 13 Oct. (PM) **1**; 14 Oct. (PM) **1**
Jamestown: 5 Oct. (PM) **2**
Middletown: 6 Oct. (KM) **2**; 9 Oct. (DS) **1**; 9 Oct. (IN) **1**; 14 Oct. (KM) **8**
Narragansett: 20 Sept. (IN) **1**
Providence: 5 Oct. (KL) **1**
South Kingstown: 17 Sept. (DG) **1**; 20 Sept. (IN) **1**; Oct. 2 (IN) **1;** 3 Oct. (PM, SG) **47+**
Tiverton: 21 Sept. (JS) **1** – Nectaring on *Cichorium intybus* (Chicory).
Warwick: 14 Oct. (DM) **2**
Westerly: 17 Sept. (MN) **10**

***Colias eurytheme* (Orange Sulphur)** – resident.
Barrington: 21 Sept. (PM) **2**
Bristol: 22 Sept. (PM) **8 -** Nectaring on *Conoclinium coelstinum* (Ageratum); 3 Oct. (PM) **4**; 9 Oct. (IN) **1** – Nectaring on *Taraxacum officinale* (Dandelion).
Charlestown: 17 Sept. (MN) **5**
East Providence: 4 Oct. (PM) **20**
Exeter: 9 Oct. (LB) **1** – Nectaring on *Phlox paniculata* (Summer Phlox).
Johnston: 7 Oct. (BT) **1**
North Kingstown: 19 Sept. (IN) **1** – Nectaring on *Zinnia* sp. (Zinnia).
South Kingstown: 17 Sept. (MN) **8**3; Sept. 20 (IN) **1**; 3 Oct. (PM, SG) **5**
Tiverton: 21 Sept. (JS) **1**
Westerly: 17 Sept. (MN) **13**; 11 Oct. (JO) **1**

***Colias philodice* (Clouded Sulphur)** – resident.
Barrington: 21 Sept. (PM) **4**
Bristol: 22 Sept. (PM) **10**
Charlestown: 17 Sept. (MN) **3**
South Kingstown: 17 Sept. (DG) **10**; 17 Sept. (MN) **11**; 28 Sept. (IN) **1** - Nectaring on *Symphyotrichum novae-angliae* (New England Aster).
Tiverton: 21 Sept. (JS) **1** – Nectaring on *Taraxacum officinale* (Dandelion)
Westerly: 17 Sept. (MN) **9**

***Phoebis sennae* (Cloudless Sulphur)** – seasonal migrant, occasionally breeding, perishing with onset of winter.
Narragansett: 2 Oct. (DG) **1**
Westerly: 17 Sept. (MN) **4** – 3 females ovipositing on *Senna marilandica.*

LYCAENIDAE

***Lycaena phlaeas hypophlaeas* (American Copper)** – resident.
Barrington: 21 Sept. (PM) **15**
Bristol: 3 Oct. (PM) **15**
Cranston: 27 Sept. (JN) **4** – Nectaring on *Solidago* sp. (Goldenrod).
East Providence: 17 Sept. (VM) **1 -** Nectaring on *Hylotelephium telephium* (Autumn Joy Sedum); 4 Oct. (PM) **10**
Pawtucket: 2 Oct. (IN) **1**
Portsmouth: 12 Oct. (IN) **1** – Nectaring on *Hylotelephium spectabile* (Autumn Joy Stonecrop).
North Kingstown: 8 Oct. (MI) **1** – Nectaring on *Rudbeckia hirta* (Black Eyed Susan).

South Kingstown: 17 Sept. (MN) **10**; Oct. 2 (IN) **1**
Tiverton: 21 Sept. (JS) **1**
Warwick: 14 Oct. (DM) **2**
Westerly: 17 Sept. (MN) **4**

***Calycopis cecrops* (Red Banded Hairstreak)** – resident.
Bristol: 22 Sept. (PM) **2 -** Nectaring on *Conoclinium coelstinum* (Ageratum).

***Strymon melinus* (Gray Hairstreak)** – resident.
North Kingstown: 20 Sept. (MI) **1**
Lincoln: 10 Oct. (IN) **1** – Nectaring on *Solidago* sp. (Goldenrod).

***Cupido comyntas comyntas* (Eastern Tailed Blue)** – resident.
South Kingstown: 17 Sept. (DG) **1**; 17 Sept. (MN) **5**
Westerly: 17 Sept. (MN) **5**

***Celastrina neglecta* (Summer Azure)** – resident.
South Kingstown: 17 Sept. (MN) **1**

NYMPHALIDAE

***Danaus plexippus* (Monarch)** – seasonal migrant, mass southbound movement in fall.
Bristol: 22 Sept. (PM) **3**
Charlestown: 17 Sept. (MN) **3**
East Providence: 4 Oct. (PM) **1**
Little Compton: 21 Sept. (JS) **1**
Middletown: 3 Oct. (LY) **1** Nectaring on *Solidago* sp. (Goldenrod); 6 Oct. (KM) **1** – Nectaring on *Solidago* sp. (Goldenrod).
Narragansett: 20 Sept. (IN) **1**; 21 Sept. (IN) **17**; 3 Oct. (IN) **1** – Nectaring on *Solidago* sp. (Goldenrod).
Providence: 19 Sept. (SD) **2**; 6 Oct. (KT) – Nectaring on *Buddleia* (Butterfly Bush).
South Kingstown: 17 Sept. (DG) **3**; 17 Sept. (MN) **12**; 3 Oct. (PM, SG) **1**; 3 Oct. (IN) **1** – Nectaring on *Nipponanthemum nipponicum* (Nippon or Montauk Daisy).
Tiverton: 21 Sept. (JS) **1**
Westerly: 17 Sept. (MN) **6**; 5 Oct. (DT) **1**

***Phyciodes tharos tharos* (Pearl Crescent)** – resident.
Barrington: 21 Sept. (PM) **2**
Bristol: 22 Sept. (PM) **3**
Charlestown: 17 Sept. (MN) **7**
South Kingstown: 17 Sept. (DG) **4**

***Polygonia comma* (Eastern Comma)** – resident.
South Kingstown: 17 Sept. (MN) **1**

***Vanessa virginiensis* (American Lady)** – seasonal migrant, perishing with onset of winter.
Barrington: 21 Sept. (PM) **1 -** Nectaring on *Cirsium* sp. (Thistle).
Bristol: 22 Sept. (PM) **2**
Charlestown: 17 Sept. (MN) **3**
Cranston: 22 Sept. (JN) **1** – Nectaring on *Buddleia* sp. (Butterfly Bush).
East Providence: 17 Sept. (PM) **1**
Foster: 12 Oct. (IN) **1 -** Nectaring on *Zinnia* sp. (Zinnia)
Middletown: 3 Oct. (LY) **1** Nectaring on *Solidago* sp. (Goldenrod).
South Kingstown: 3 Oct. (PM, SG) **2**
Warwick: 14 Oct. (DM) **1**
Westerly: 17 Sept. (MN) **2**; 13 Oct. (NA) **1 -** Nectaring on *Buddleia* sp. purple var. (Butterfly Bush).

***Vanessa atalanta* (Red Admiral)** – seasonal migrant, perishing with onset of winter.
Jamestown: 5 Oct. (PM) **1**

***Limenitis archippus archippus* (Viceroy)** – resident.
Charlestown: 17 Sept. (MN) **2**
South Kingstown: 17 Sept. (MN) **2**

***Lethe appalachia appalachia* (Appalachian Brown)** – resident.
South Kingstown: 17 Sept. (MN) **1**

***Cercyonis pegala alope* (Common Wood Nymph)** – resident.
South Kingstown: 17 Sept. (MN) **2**

HESPERIIDAE

***Atalopedes huron* (Eastern Sachem)** – resident.
Barrington: 21 Sept. (PM) **1**
Bristol: 22 Sept. (PM) **20+** – Nectaring on *Conoclinium coelstinum* (Ageratum), *Verbena bonariensis* (Purpletop Vervain), *Zinnia* sp. (Zinnia); 3 Oct. (PM) **7**
Charlestown: 17 Sept. (MN) **50+**
East Providence: 17 Sept. (PM) **1 -** Nectaring on *Buddleia*.
Jamestown: 17 Sept. (SF) **2**
Little Compton: 21 Sept. (JS) **1**
Narragansett: 20 Sept. (IN) **1**
North Kingstown: 19 Sept. (IN) **2** – Nectaring on *Celosia cristata* (Cockscomb), *Symphyotrichum novae-angliae* (New England Aster).
Providence: 19 Sept. (SD) **1**
South Kingstown: 17 Sept. (DG) **3**; 17 Sept. (MN) **50+**; 3 Oct. (PM, SG) – **"too many to count" +7**
Tiverton: 21 Sept. (JS) **2**
Westerly: 17 Sept. (MN) **80+**

***Polites themistocles themistocles* (Tawny-edged Skipper)**
Bristol: 22 Sept. (PM) **4** (R.I. late record) **-** Nectaring on *Conoclinium coelstinum* (Ageratum), *Centaurea stoebe* (Spotted Knapweed).
South Kingstown: 3 Oct. (PM, SG) **2**

***Ancyloxypha numitor* (Least Skipper)** – resident.
South Kingstown: 17 Sept. (DG) **2**

***Panoquina ocola* (Ocola Skipper)** – seasonal migrant, perishing with onset of winter.
South Kingstown: 3 Oct. (PM, SG) **1**

CATERPILLARS

***Papilio polyxenes* (Black Swallowtail)** – resident.
Bristol: 8 Oct. (IN) **1** – Caterpillar on unidentified host.

***Pterourus troilus troilus* (Spicebush Swallowtail)** – resident.
Coventry: 17 Sept. (MS) **3 -** Caterpillars on *Lindera benzoin* (Spicebush) and *Sassafras albidum* (Sassafras).

***Danaus plexippus* (Monarch)** – seasonal migrant, mass southbound movement in fall.
North Kingstown: 26 Sept. (IN) **1** – Caterpillar on *Asclepias* sp. (Milkweed).

***Vanessa virginiensis* (American Lady)** – seasonal migrant, perishing with onset of winter.
Charlestown: 3 Oct. (IN) **1** – Caterpillar on *Aletris fainosa* (Colicroot).

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A review of the status of *Poanes massasoit hughi* Clark, 1931, confirming status as a range-wide variant form of *P. massasoit* (Scudder, 1863).

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ABSTRACT: *Poanes massasoit hughi* was described as a new subspecies (Clark, 1931) based on a common, predominant phenotype occurring in Maryland, differentiated from specimens of the nominotypical phenotype occurring in eastern Massachusetts. Clark apparently had very limited access to specimens, thus unable to see that the "*hughi*" phenotype occurs throughout the range of *P. massasoit.* Subsequent treatment of *hughi* as either a subspecies or form of *P. massasoit* varies across the literature. This paper utilizes cartographic analysis, coupled with internet-based imagery, to determine the distribution of the *hughi* phenotype within the range of *P. massasoit.*

INTRODUCTION

Samuel Scudder (1863) initially described new species *Hesperia massasoit* from a small series of specimens from Massachusetts and Connecticut (**Fig. 1**). The distinguishing feature was described for the secondaries beneath: "The central portion of the wing is entirely taken up by a large sulphur-yellow spot of irregular shape".

65. HESPERIA MASSASOIT nov. sp. ♂ Above very dark-brown with a mulberry lustre, having no markings except occasionally a faint small yellowish spot or two on middle of secondaries, fringe slightly paler, yellowish around the inner angle of secondaries.

Beneath: *Primaries* hardly so dark as above, with reddish-yellow scales scattered along the costal border, and on the outer border, especially toward the apex; two very small spots of same color, about midway between extremity of cell and apex of wing, with two large ones at the middle of the wing, the inner a little lower than the outer: *Secondaries* dark-brown with profusely scattered reddish-yellow scales, especially toward the inner angle; the central portion of the wing is entirely taken up by a large sulphur-yellow spot of irregular shape, formed of a straight broad band, extending between the subcostal and median nervures, nearly to the hind border, cut across by an incurved line of reddish-yellow scales just below the divarication of the subcostal, and crossed by a transverse broad band, just beyond the middle of the wing, extending from costal to submedian nervures, cut across by the reddish-yellow scales following the nervules, and bent somewhat upon either side of the first band.

♀ Differs from ♂ only in having the markings of the under surface of the primaries repeated above, and a faint transverse band of distant reddish-yellow spots across the middle of secondaries. Expanse of wings 1.1—1.4 in. Very rare; I have seen it only from Carver, Mass., Mr. Shurtleff, Conn., Mr. Edwards, and New-England, Museum of Comp. Zoology.

Fig. 1. Original description as *Hesperia massasoit* from Scudder (1863).

Scudder (1863) did not illustrate the holotype of *Hesperia massasoit* in the original description, nor did he provide life history information. The presumed male holotype is now available online via the Museum of Comparative Zoology (**Fig. 2**). A female was later illustrated in Scudder (1889) (**Fig. 3**). The original description indicated the TL in Carver, MA. (Plymouth County).

Fig. 2. Presumed holotype of *Hesperia massasoit* (Scudder, 1863), courtesy Museum of Comparative Zoology. Accessible at: IMG_172114.JPG (3456×5184) (harvard.edu) and IMG_172115.JPG (3456×5184) (harvard.edu)

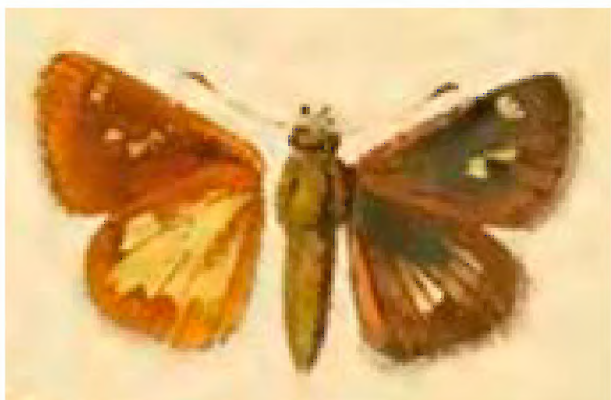

Fig. 3. *Poanes massasoit* ♀ from Scudder (1889).

The characteristic feature of *massasoit* is the broad yellow patch on the ventral side of the hindwings. Scudder's 1889 figure shows a broader patch on the illustrated female, than on the "type" housed in the collection of the Museum of Comparative Zoology. Specimens of *massasoit* that were examined indicate no appreciable difference in ventral markings between males and females. However, the females tend to have more well-developed yellow marks on the dorsum, than do the males which are mostly dark. The present analysis is focused on the ventral patch.

In Scudder (1889), the author provided limited life history information, describing *massasoit* as a characteristic member of the Alleghenian fauna, and states that the western limits of its range are uncertain, but listing such states as Texas and Colorado. These western localities require verification, as no modern records or specimens exist nor were specimens available from these states via online imagery or literature. Scudder stated that the species is double brooded, based on early appearance in the first half of June, with a second brood appearing in the second week of July, flying until after the middle of August. This is certainly in error, as all recent observations indicate it is univoltine, flying from June through August. The habitat is described as "swampy places", including cranberry bogs. Scudder admits, "We are wholly ignorant of its early stages", thus the need for additional information. More recent observations limit its presence to association with the host *Carex stricta* (Tussock Sedge), generally in open or shrubby wetlands, or within small stands of the host in forested habitat.

Poanes massasoit hughi (Clark, 1931) was subsequently described as a new subspecies from the southern part of the species range (**Figs. 4, 5**):

1. Poanes massasoit hughi, subsp. nov.

Resembling *P. m. massasoit*, but slightly larger and darker, the female with the yellow markings above reduced to small spots and partly, or sometimes completely, absent. Beneath with the costal and outer border of the fore wings and the ground color of the hind wings much darker and more reddish than in *P. m. massasoit*, and the yellow markings on the hind wings less extensive. Yellow markings on the hind wings beneath consisting of a broad yellow band, often more or less obscured, except for the inner end and the outer third or fourth, with rusty, as wide as the interspace which basally extends for a short distance within the cell and outwardly ends at a distance from the outer border which is somewhat greater than the length of the fringe; above the outer third of this band is a small yellow oblong spot not twice as broad as long with sometimes a similar or smaller one above it; between the outer end of the band and the abdominal border of the wing is a series of two or three oblong spots which are usually about twice as long as broad.

Locality.—Beltsville, Maryland; bog between the railway station and the experiment farm of the Bureau of Animal Industry, U. S. Department of Agriculture; Hugh Upham Clark, collector, July 15, 1928.

Fig. 4. Original description of *Poanes massasoit hughi* Clark (1931).

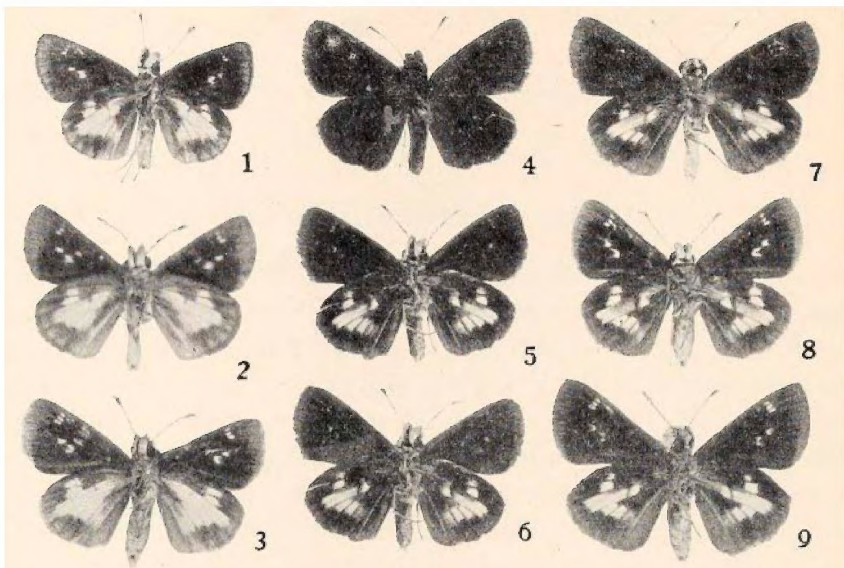

FIG. 1. 1, *P. massasoit massasoit* Scudder, ♂, underside, Weston, Mass., July 9, 1923; 2, Do.; 3, Do., ♀; 4, *P. massasoit*, var. *hughi* Clark, ♂, upperside, Beltsville, Md., July 15, 1928, type; 5, Do., ♂, underside, type; 6, Do., ♂, paratype, underside; 7, Do., ♂, paratype; 8, Do., ♀, underside; allotype; 9, Do., ♀, paratype.

Fig. 5. Original illustrations courtesy of Annals of the Carnegie Museum.

Clark (1931, 1932), in his description of *hughi*, compared his type series of specimens from Beltsville (Prince Georges County), MD. against a small series of nominotypical *massasoit* from a bog in Weston (Middlesex County), MA. (**Fig 5**), stating that the specimens from Beltsville averaged slightly larger, with the ground color being uniformly darker (blackish brown) in both sexes and the males showing violet reflections. Clark apparently had access to a very limited number of specimens from Massachusetts to compare to new subspecies *hughi.* The illustrated specimens from Weston displayed rather strikingly well-developed ventral patches (**Fig. 5**), much more so than the original holotype of *massasoit* (**Fig. 2**). Upon closer examination, the holotype of *massasoit* (**Fig. 2**) shows a slight tendency toward intermediate characters in development of the ventral patch. Clark did note that adults of *hughi* in central Maryland have greatly reduced yellow spots on the ventral and dorsal sides of the forewings, whereas in nominotypical *massasoit*, the forewings of females show a series of well-developed spots both dorsally and ventrally. However, these features vary widely across the species range. Also, Clark's description of Beltsville specimens being darker with violet reflections appears to reflect the fresh condition of specimens near where Clark resided, as opposed to what are presumed to be older specimens from Massachusetts.

My initial goal was to evaluate whether *hughi* does, in fact, represent a subspecific taxon, limited to the area in central Maryland immediately north of Washington D.C., or if *hughi* simply represented a variable form within the greater range of *P. massasoit.* Over a period of several years, I have tried to find a suitable "bog" habitat in the area immediately adjacent to the present-day Beltsville (MARC) rail station and the Greenbelt Rail Yard in Prince George's County. The late Richard "Dick" Smith (pers. corr.) similarly tried to relocate the original bog described by Clark, but was unable to find it. There are several small wetland habitats in the immediate area associated with the Indian Creek drainage in Beltsville, MD., but none with suitable growth of the known host *Carex stricta*. Any formerly desirable wet habitats are now long gone, either having been developed, paved over, or left in somewhat of a "natural" state but overgrown with trees or invasive grasses and brambles such as *Rubus fruticosus* (Blackberry) or *Rosa multiflora* (Multiflora Rose). There are considerable areas to the north and east of Beltsville where wetland habitats are evident in satellite imagery. However, from personal experience, many of those wetlands are inaccessible, or on posted properties. Thus, it was not possible to ascertain if the characters of *hughi*, in a larger series from the TL would hold up to the original description.

Clark (1932) gives description of the habitat of *hughi*, stated to be "boggy meadows with sphagnum adjacent to woods". The butterfly is described as being locally abundant. The immature stages are reportedly able to withstand frequent flooding of the habitat following heavy rainfalls. The flight period is throughout the month of July. I have found them in two locations in central Maryland in fen habitats dominated by the host *Carex stricta*. One of these locations, at Harmans, MD (Howard County) was eventually overgrown with a tall sedge or grass, no doubt invasive, that crowded out the host sedges, which had entirely disappeared. These habitats are very sensitive to changes in ground water table, changes in the landscape, and urban precipitation drainage remediation; also, to urbanization in general. However, the Harmans colony, and a colony at Daisy, MD (Howard County), well-known to local lepidopterologists, produced an adequate series of specimens, as well as additional observations of the ventral phenotype.

My field observations in the two locations over several years indicated that the *hughi* variant was indeed the predominant phenotype in the study region immediately north of Washington D.C., though intermediates to the nominotypical form are frequent. No nominotypical variants were ever found. One would be tempted to assume this would support status of subspecific rank, albeit in a tiny range.

While Scudder originally described the western range of *P. massasoit* as far west as Colorado (no doubt in error), Nebraska and Texas (no doubt in error), interestingly Clarke included in his original 1931 description, a note by W. J. Holland, indicating that several specimens of form *hughi* from Nebraska were located in the collection of W. H. Edwards, and three specimens from South Dakota were identified in the

Ehrmann Collection of the Carnegie Museum of Natural History. Vanessa Verdecia at the Carnegie Museum indicated there are five specimens labelled "Nebr." in the W. H. Edwards collection, indicated as subspecies *hughi*, but without data. These specimens likely predate Scudder (1863) and may be the source of the Nebraska reference. Neither Johnson (1973), Neck (1996), or Fisher (2017) list *massasoit* in their publications for Colorado, Nebraska and Texas. However, recent evidence of *P. massasoit* in Nebraska was posted to the Nebraska Lepidoptera website (https://nebraskalepidoptera.com/massasoit2/), showing the *hughi* variant in the eastern part of the state.

Unfortunately, both Scudder and Clark had limited access to specimens in their days. With the advent of the internet, imagery has become widely available and reliance on often difficult-to-access institutional collections is no longer a hindrance to avocational studies as in pre-internet days.

Scudder's description of *massasoit* from southeastern Massachusetts is based on the very broad yellow patch on the ventral hindwing. This phenotype is present throughout New England, but is also present range-wide, except in central Maryland where the *hughi* phenotype is predominant. However, in examining imagery posted to iNaturalist.org (iNat) and Butterfliesandmoths.org (BAMONA), a different distributional picture emerges, one which often reflects, to some extent, photographic bias of imaging a single specimen at a site, thus leading to an incomplete picture of regional variation. Examination of specimens in the Smithsonian's National Museum of Natural History (NMNH) likely also reflects incomplete sampling. However, examination of imagery on the web, in literature, and in collections, pointed to the need for an adequate distributional study to determine if the *hughi* phenotype represents a subspecific taxon.

SUBSEQUENT LITERATURE TREATMENT OF *HUGHI*

McDunnough (1938) listed *hughi* at subspecies rank. Macy & Shepard (1941) list "race *hughi*" and indicate a range of New Jersey, Maryland, Georgia, Nebraska and South Dakota. The Georgia report is certainly in error, as Harris (1972) does not list *P. massasoit* for that state. H. Clark & L. F. Clark (1951) included subspecies *hughi* for Virginia, and though there were no records at the time, suggested that it will "probably" be found in Virginia. Klots (1951) listed subspecies *hughi* but commented: "If this is a valid subspecies it cannot come from so wide an area as New Jersey, Maryland, Georgia, Nebraska, and South Dakota as cited; if it does, it is merely a color variety." Tietz (1952) listed *hughi* for Pennsylvania at subspecies rank. Forbes (1960) listed "var. *hughi*" from Beltsville, MD, but lists the range of *P. massasoit* extending west to Wisconsin, Colorado and Texas (certainly in error for CO and TX). In the first Synonymic List of the Lepidopterists' Society, dos Passos (1964) listed *hughi* at subspecies rank. Tietz (1972) listed *hughi* at subspecies rank. In Simmons & Anderson (1980), the authors suggested a cline between nominotypical *massasoit* and ssp. *hughi* along the Fall Line separating the Coastal Plain from the Piedmont in Maryland. Miller & Brown (1981) listed "hughi" as a form; a status maintained in the Ferris (1989) Supplement. In Hodges (1983), *hughi* is listed in the synonymy under *Poanes massasoit.* Pelham (2008) [including annual updates through 2023] lists *hughi* as a subjective synonym under *Poanes massasoit.* Pohl & Nanz (2023) list *hughi* as a subjective synonym under *Poanes m. massasoit.*

Of special interest is a paper by Anderson & Simmons (1976) in the Journal of the Lepidopterists' Society. The authors described new subspecies *Poanes massasoit chermocki* from Dorchester County, MD. in which they treated *hughi* as a subspecies. They made comparisons between new subspecies *chermocki* and *hughi*, and suggested that there is a north-south cline in which *hughi* represents an intergrade between nominotypical *massasoit* of the north, and *chermocki* of the south. The authors only compared specimens of *hughi* from northern Maryland to new subspecies *chermocki* from the Delmarva Peninsula, providing the justification that "Clark (1932) has already very adequately compared *P. m. massasoit* and *P. m. hughi.* By

thus limiting their comparison to northern and southern Maryland, and relying on Clark, the authors failed to note the presence of the *hughi* variant northward in Massachusetts and elsewhere.

Though beyond the scope of this paper, is an interesting paper by Shapiro (1971), discussing the postglacial biogeography of several marsh dwelling butterflies and what he referred to as the "Great Lakes-Northern Coastal Plain disjunction" occurring in many butterfly species. This post-Wisconsin glaciation disjunction appears as an odd distribution on either side of the Appalachian Mountains which appears to be a dividing region in which there are no records of the studied butterflies. In focusing discussion on the distribution of *Poanes viator*, Shapiro notes that the range of *viator* is neatly divided into a Coastal Plain element (subspecies *zizaniae*) and a Great Lakes element (nominate *viator*) approximately along the south edge of the Wisconsin glaciation, a pattern followed by the other Hesperid butterflies in the study. All of the Hesperid butterflies in Shapiro's study are limited to marsh habitats, and utilize either sedges (Cyperacaeae) or grasses (Gramineae), and are univoltine in midsummer. Shapiro believed that populations of the studied species travelled westward through a corridor of the Mohawk and Hudson Valleys of central New York to repopulate the Great Lakes region after the retreat of the Wisconsin glaciation. *Poanes massasoit* also shows this disjunct distribution, as evidenced on the distributional maps in Figs. 7, 8 and 9 of the present study, and Shapiro notes that populations on either side of the disjunction are virtually identical except for a single relict population in central New York state, which are uniquely different by having a more heavily-patterned dorsum.

METHODOLOGY

Specimens were examined from a variety of web-based imagery, primarily iNat and BAMONA. Additional imagery was found on a broad range of individual online photographic galleries, too numerous to mention. Specimens from the NMNH collection were examined, as well as from the American Museum of Natural History and a small series in my personal collection. The three basic variants are illustrated in **Fig. 6**, representing nominotypical *massasoit* (A), *hughi* (C) and intermediates (B).

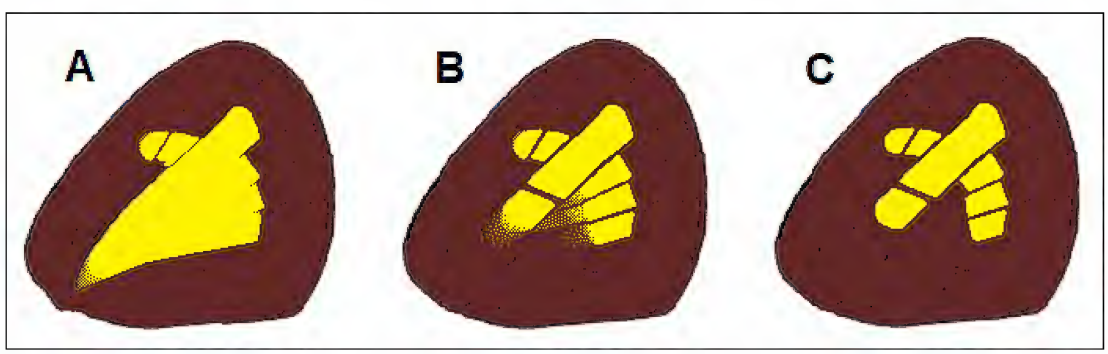

Fig. 6. Three basic variant forms of *P. massasoit*: (A) nominotypical form; (B) intermediate form; (C) form *hughi*. All figures represent the ventral hindwing.

The distribution of these variants was then mapped by county or regional municipality (Canada) in order to better determine the range of each (**Figs. 7, 8, 9**). The resulting distributional maps are rather revealing, showing the three phenotypes (**Fig. 6**) to be widespread variant forms throughout the range of *massasoit*.

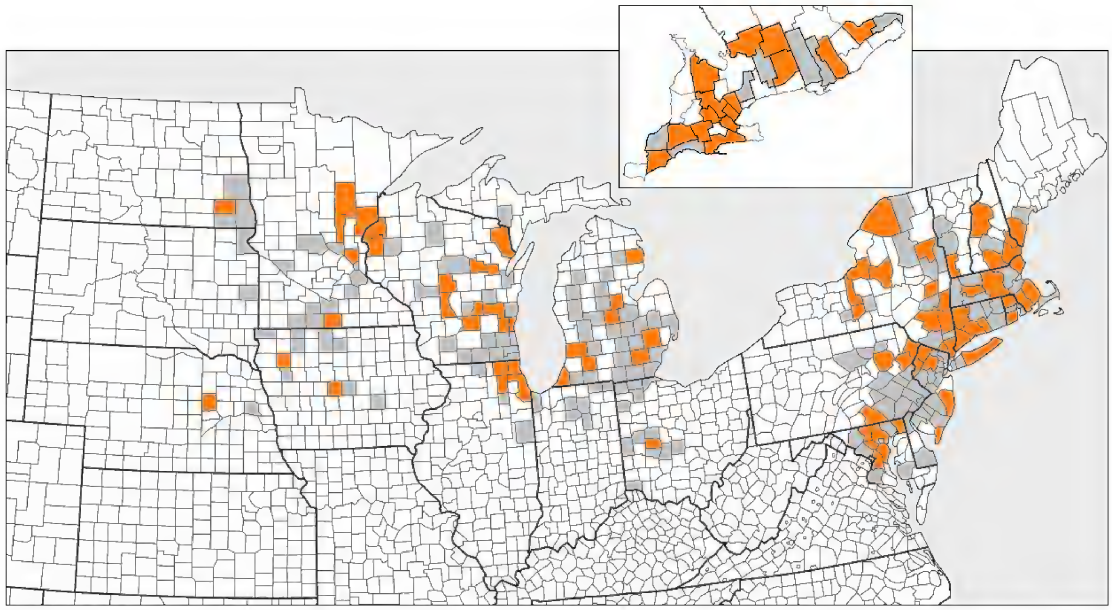

Fig. 7. Distribution of *hughi* phenotype (ORANGE). Complete range of *P. massasoit* is shown as GRAY counties. Inset shows range in Ontario, Canada.

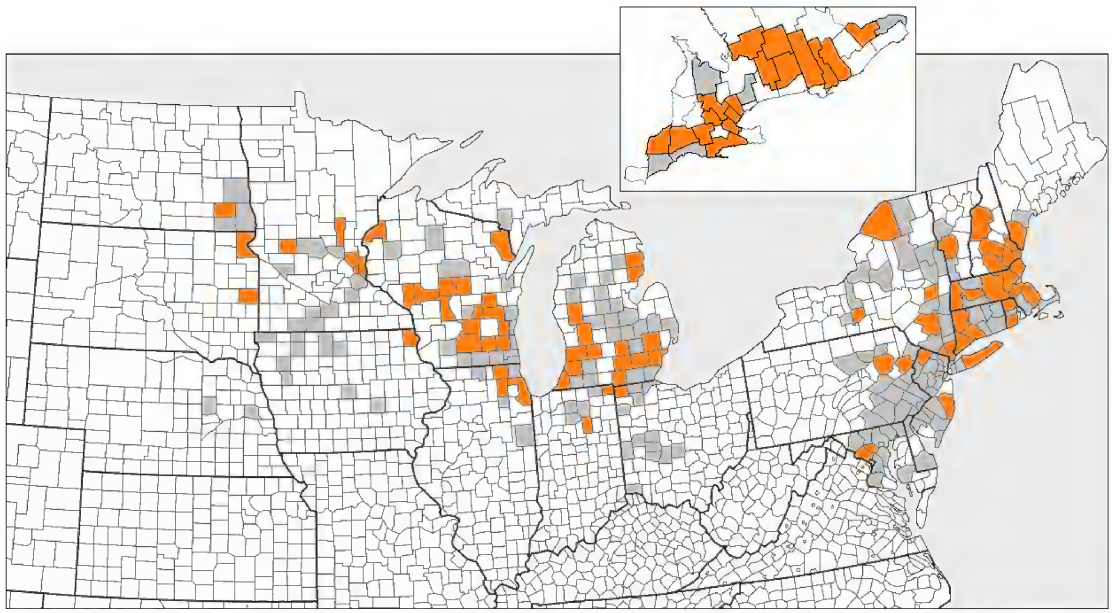

Fig. 8. Distribution of intermediate variants (ORANGE). Complete range of *P. massasoit* is shown as GRAY counties. Inset shows range in Ontario, Canada.

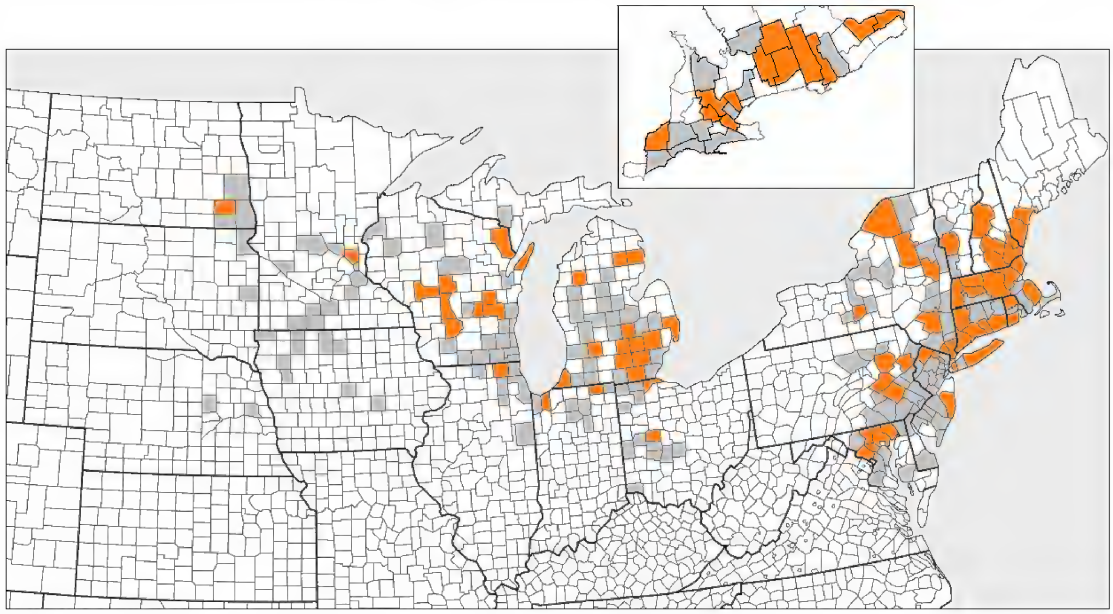

Fig. 9. Distribution of nominotypical *massasoit* phenotype (ORANGE). Complete range of *P. massasoit* is shown as GRAY counties. Inset shows range in Ontario, Canada.

CONCLUSION

The distributional maps indicate that across the range of *P. massasoit* a broad range of variation occurs including the nominotypical form, the *hughi* phenotype and intermediate variants. Even at the TL of *massasoit* in southeastern Massachusetts, a broad range of variation exists, with the nominotypical phenotype at one end of the spectrum and the *hughi* phenotype at the other end. The conclusion derived here confirms that *hughi* essentially is a common variant form of *P. massasoit* that occurs range-wide.

The extent of the yellow ventral patch in *P. massasoit* displays a broad range of variation (**Fig. 10**). While the nominotypical phenotype, *hughi* phenotype and intermediates occur across the species range, variants displaying minimal development of the yellow patch occur at the extreme southeastern end of the species range. Subspecies *chermocki* Anderson & Simmons, 1976 (**Fig. 10 E**) is primarily limited to a very small area on the Delmarva Peninsula of Maryland. The ventral patch is reduced to a row of postmedian spots and a weakly developed discal spot. Thus, *hughi* can be considered to be an intermediate form to *chermocki* (**Fig. 10**). Considerably darker is the variant form "*suffusa*" (**Fig. 10 F**), known mainly from along the Atlantic Coastal Plain from New Jersey to Maryland. Darker yet are rare melanic forms showing no trace of the ventral patch (**Fig. 10 G**).

Fig. 10. Variation in *P. massasoit:* (**A**) Nominotypical subspecies *massasoit,* Montgomery Co., MD. (**B**) Intermediate variant, Providence Co., R.I. (**C**) Variant form *hughi*, Providence Co., R.I. (**D**) Intermediate variant, Howard Co., MD. (**E**) Subspecies *chermocki,* Dorchester Co., MD. (**F**) Form "*suffusa*", Dorchester Co., MD. (**G**) Melanic variant, Dorchester Co., MD. All views ventral side.

While not justifiable as a subspecies, the *hughi* phenotype is the primary form in central Maryland. With the complete absence of the nominotypical form within the documented *hughi* colonies in Maryland, some local lepidopterologists still treat *hughi* as a localized subspecies, even though it is a widespread form throughout the entire species range.

A WORD ON *POANES MASSASOIT CHERMOCKI* ANDERSON & SIMMONS, 1976

While in the process of researching the distribution of *P. massasoit*, it was learned that the isolate subspecies *chermocki* has not been found in the type locality in Dorchester County, Maryland, or one additional location in Delaware for several decades as of this writing. Last reports from the TL were from about 2007 despite intensive, repeated searches. Reports from several naturalists stated that the accessible roadside habitat at the TL has been cut and herbicide possibly applied. The portion of the habitat possibly still supporting the TL colony is essentially inaccessible. However, records of the *chermocki* phenotype have historically been found as singletons in other portions of the species range, no doubt showing that *chermocki* is yet a more extreme variant in those areas. Records of *chermocki* are from: Delaware: Sussex Co. (NatureServe Explorer, accessed April 1, 2024). Maryland: Cecil Co. ("We note that in our collections of *hughi* from north central Maryland forms similar to *chermocki* occur at a rate of approximately 4 per cent." (Anderson & Simmons, 1976); Dorchester Co. (TL); Howard Co. (one specimen within a *hughi*-dominant colony, collected by H. Pavulaan); Prince Georges County (one specimen near the *hughi* TL (Clark & Clark, 1932). Michigan: Wayne Co. (collected by M. C. Nielsen (Lepid. Soc. Season Summary, accessed April 1, 2024)). Nebraska: Boone Co. (S. Spomer collection).

ACKNOWLEDGEMENTS

Thanks to David M. Wright for review of the manuscript. Thanks also Steve Spomer for records at the western edge of the species range.

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ADDITIONAL SOURCES OF IMAGERY

Butterflies and Moths of North America: https://www.butterfliesandmoths.org
Butterflies of America: https://butterfliesofamerica.com
eButterfly: https://www.e-butterfly.org
iNaturalist: https://www.inaturalist.org
NatureServe Explorer:
https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.112629/Poanes_massasoit_chermocki
Nebraska Lepidoptera: https://nebraskalepidoptera.com/massasoit2/
The Lepidopterists' Society Season Summary:
https://scan-bugs.org/portal/collections/individual/index.php?occid=44461465&clid=0

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The Taxonomic Report, Vol. 11, No. 8. April 29, 2024

An updated geographic analysis of regional variation in *Anthocharis midea* (Hübner, [1809]) and review of dos Passos & Klots (1969) and Gatrelle (1998).

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ABSTRACT: Subspecies are defined as geographically-cohesive phenotypes across defined ranges and are allopatric from related subspecies. *Anthocharis midea* defies our current understanding of this concept, rather consisting of a variable, polytypic form-complex based on the orange male apical patches and degree of dorsal black scaling on the base of the adult wings. While dos Passos & Klots (1969) made headway in our understanding of *midea* and its subspecies, the authors had somewhat limited access to specimens. Gatrelle (1998) provided additional information. With the availability of online imagery, we are now able to revisit their findings and develop a much better understanding of this complex.

INTRODUCTION

The appropriately named "Falcate Orangetip" was originally illustrated and labeled as *Mancipium vorax Midea* (Hübner [1809]) but without verbal description (**Fig. 1**) or locational information. The apical orange patch in the male extends inward from the apex and encloses the discal black spot of the forewing. Though not depicted in the original illustration, a small percentage of males display a faint cloud of orange on the outer (apical) portion of the hindwing.

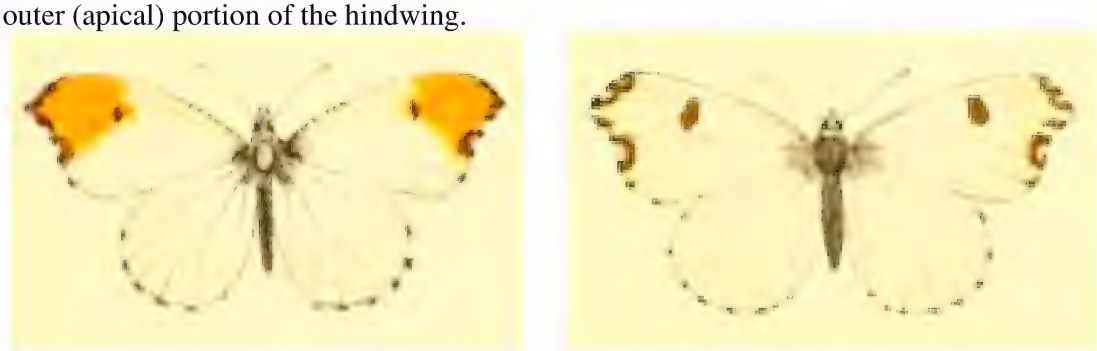

Fig. 1. Original illustrations from Hübner (1809). Male, left image; female, right image.

Dos Passos & Klots (1969) produced an extensive review of regional variation in *A. midea* and designated a neotype of *A. m. midea* from "Wilmington I., near Savannah, Georgia" matching the phenotype illustrated by Hübner (1809). The authors stated: "The chief, if not the only reliable, character in which *A. midea* shows significant geographic variation is the extent of the apical orange patch on the upper side of the forewings of the male…Unfortunately, little or no material from several important regions was available for study." In that work, they described a new subspecies from West Rock, New Haven, Connecticut, which they named *A. midea annickae.* This type locality is at the farthest northeastern extremity of the species' range. Subspecies *annickae* is differentiated from nominotypical *A. m. midea* in that the apical orange patch is more restricted in size (**Fig. 2(B)**). Females of both subspecies are indistinguishable from each other (**Figs. 2(G)** and **2(H)**).

Dos Passos & Klots produced a table in which 320 male specimens were divided into 7 "pattern groups", A through G, based on the extent of the male apical orange patch. For the purposes of the present study, groups A and B, in which the orange patch touches or encloses the black discal spot, are referred to here as the "**large-patch**" group, analogous to nominotypical *midea* (**Figs. 1, 2(D)**). Groups F and G are here referred to as the "**small-patch**" group in the present study, analogous to subspecies *annickae* (**Fig. 2(B)**), which are identified by the greatly reduced size of the male apical orange patch. However, in the

present study, the "small" patch is defined as extending approximately 50-65% the distance from the forewing hook to the black discal spot. "**Intermediate-patch**" specimens, in which the patch is greatly enlarged, but not touching the black discal spot, are recorded separately in the present study. These would include those specimens placed in groups C, D and E by dos Passos & Klots (**Fig. 2(C)**). However, in the present study, the intermediate patch is defined as being greater than a distance of approximately 65% from the forewing hook, to the discal spot, but not touching the discal spot (generally leaving a white space between the patch and discal spot, equaling the size of the discal spot).

Of note, "large-patch" specimens in the present study, that were previously assigned to groups A and B of dos Passos & Klots, comprised 89.9% of all their examined specimens (n=33) of *A. midea* in coastal Georgia and South Carolina, leaving 10.1% in the "intermediate-patch" group and 0% in the "small-patch" group. This is corroborated by the observations of Gatrelle (1998) of the predominance of large-patch individuals in the Georgia and South Carolina coastal region. By comparison, a small number of specimens analyzed in the present study from those same coastal areas were also of the "small patch" variants. I suspect there may have been some sampling bias in the series that dos Passos & Klots and Gatrelle examined. Dos Passos & Klots also noted in their analysis, that nearly half of specimens from both Hinds Co., Mississippi and Baron Co., Missouri, could be assigned to either *midea* or *annickae,* but they lacked material from much of the inland region west of the Appalachians, here recognized as *midea*.

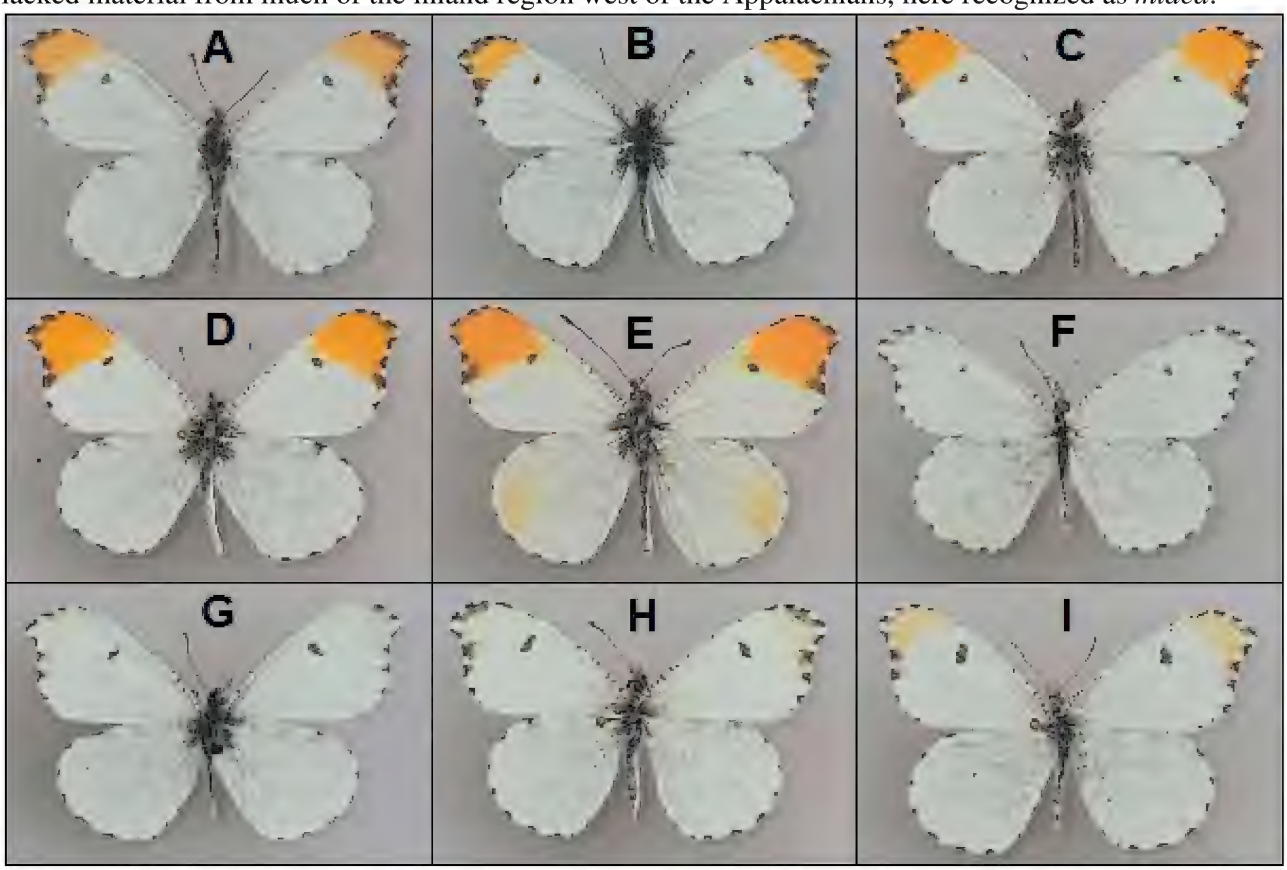

Fig. 2. **(A)** Intermediate-patch male with light wing base (subspecies *texana.* Wise Co., Texas). **(B)** Small-patch male (subspecies *annickae.* New Haven Co., Connecticut). **(C)** Intermediate-patch male (subspecies *midea.* St. Francois Co., Missouri). **(D)** Large-patch male (subspecies *midea.* St. Francois Co., Missouri). **(E)** Large-patch male with orange tint on hindwings (subspecies *midea.* Colleton Co., South Carolina). **(F)** Female with light wing base (subspecies *texana.* Smith Co., Texas). **(G)** Female (subspecies *annickae.* Frederick Co., Virginia). **(H)** Female (subspecies *midea.* Colleton Co., South Carolina). **(I)** Female with orange-tinted apical patch (subspecies *annickae.* Montgomery Co., Maryland).

Dos Passos & Klots (1969) summarized this well: "The matter of referring populations to one subspecies or another is subjective and can only be done on the basis of material available at the moment. Such decisions are always subject to review as new populations and more specimens come under study."

Gatrelle (1998), having sampled additional *midea* populations in South Carolina and Georgia, believed the large-patched *A. m. midea* is restricted to the coastal islands and immediate coast of Georgia and South Carolina, with *A. m. annickae* occupying the inland Sandhills region within 40 km of coastal *A. m. midea.* Gatrelle's samples indicated that 20-50% of coastal *midea* males possess an orange tint on the apical portion of the hindwings, representing extreme development of the orange markings. I have only observed two out of 20 males from Edisto Beach, S.C., making my percentage somewhat smaller (10%). While Gatrelle felt that the large-patched *midea* male variants were "rare" inland, he indicated that, over a 30-year period, he observed subspecies *midea* "further and further inland and *annickae* closer and closer to the coast." I suspect that Gatrelle's further sampling simply revealed the greater degree of variation already present in South Carolina and Georgia. Dos Passos & Klots had indicated "The population of inland Georgia above the fall line is also characterized by an extensive orange patch, but this is less extensive and less consistent…than in the coastal one." They concluded that there is a north-south cline east of the Appalachians from Connecticut to Georgia, with "a major break" south of Virginia. The late William Grooms and I have personally sampled (collect and net-release) over 143 specimens since 1988 from northern Virginia and central Maryland, and conclude that nearly 100% of *midea* are of the small-patched form, with the sole exception of a single large-patched individual from Fairfax County, no doubt an aberrant in this region. More recent sampling via collections and online imagery indicates a more complex picture throughout the species range.

METHODOLOGY

A series of maps was produced by analyzing a variety of sources including imagery from iNaturalist (iNat) and Butterfliesandmoths.org (BAMONA), as well as specimens in the Smithsonian National Museum of Natural History (NMNH), American Museum of Natural History (AMNH), the collections of Steve Spomer, Ricky Patterson, the late Ron Gatrelle, and my personal collection, and lastly a variety of online image galleries and literature sources. Specimens are here divided into three groups based on the extent of the male orange apical patch, which, in turn are based on groups A through G established by dos Passos & Klots (1969): small-patch (groups F, G) (**Figs. 2(B)**); intermediate-patch (groups C, D, E) (**Fig. 2(A, C)**); and large-patch (groups A, B) (**Figs. 2(D, E)**). Subspecies *texana* (Gatrelle, 1998) (**Fig. 2(A)**) was mapped separately, based on a single character (clear white dorsal wing bases). In the case of *texana*, females were included in the analysis along with males. Females of nominotypical *midea* and subspecies *annickae* are virtually indistinguishable, thus not mapped.

First, individuals of the small-patched variant, based on dos Passos & Klots (1969) groups F and G were mapped (**Fig. 3**). This variant form approximates what has been traditionally considered subspecies *annickae.* It is immediately apparent that this variant form occurs range-wide, but dominates the eastern portion of the species' range from Massachusetts to South Carolina and just west into the Ohio River drainage. Small-patched individuals again dominate the western edge of the species' range from Texas to Kansas, and east into the Mississippi River drainage, as subspecies *texana.* Next, individuals of the intermediate-patched variant were mapped (**Fig. 4**), based on dos Passos & Klots (1969) groups C, D and E. Interestingly, these variants dominated the central portion of the species' range, from North Carolina across to the eastern edge of Texas, Oklahoma and Kansas.

Individuals of the large-patched variant were then mapped (**Fig. 5**), based on dos Passos & Klots (1969) groups A and B. This variant form approximates what has been traditionally considered nominotypical subspecies *midea.* However, it is important to note that large-patched *midea* range broadly

from the South Carolina/Georgia coast across to the eastern edge of Texas, Oklahoma and Kansas and north into the Missouri and Ohio River drainages, with outlier records in northern Virginia, Washington D.C. and northern New Jersey [outliers are more likely to be documented around major urban centers, due to a greater number of collectors and photographers].

Most individuals in the eastern portion of the species' range display dorsal dark scales at the base of the wings (**Figs. 2(B, C, D, E, G, H, I)**), whereas most individuals in the far western edge of the species' range do not display this dark scaling (**Figs. 2(A, F)**), having the dorsal wing bases entirely white. Those are considered subspecies *texana.* Both of these variant basal forms are mapped here (**Fig. 6**), showing distribution of individuals with clear white wing bases (*texana*), individuals with black wing bases ("not-*texana*") and areas where both types are present, indicating a blend zone or zone of secondary contact (Gatrelle, 1998). This latter finding was rather surprising, as infrequent individuals meeting the description of *texana* were recorded well eastward, as far as South Carolina.

Finally, all four maps are combined to obtain an overall picture showing distribution of maximum orange apical patch size, with distribution of *texana* overlaid (**Fig. 7**). This map was then simplified (**Fig. 8**) to show the approximate range of each subspecies: *annickae, texana,* and *midea*, with *midea* divided into a *texana*-influenced intermediate western zone in which both white and black wing-base adults occur, whereas "typical" black wing-base adults dominate in the eastern portion. Continued sampling, either photography or collection-based, will be needed to fill in gaps in the range.

Lastly, additional maps were created to determine regional distribution of females displaying orange tinted forewing apical areas, corresponding to the male orange patch (**Fig. 9**). Distribution of large-patched males displaying orange tint on the outer portion of the hindwings was also mapped (**Fig. 10**). This orange tint on the male hindwings highlights maximum development of the nominotypical "*midea*" form.

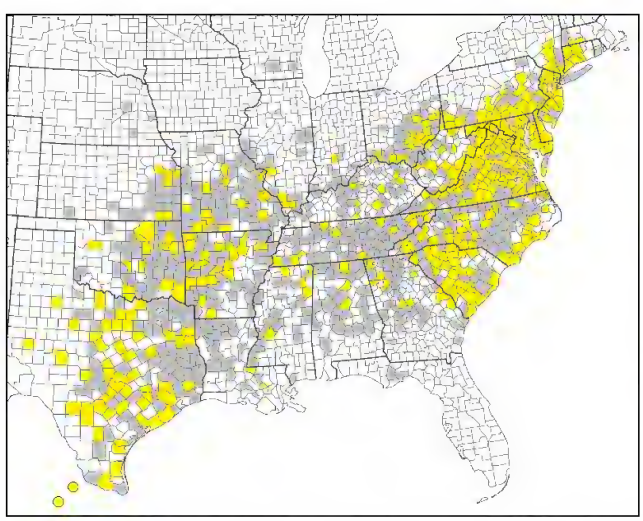

Fig. 3. County distribution of "small-patched" variants (shown in yellow).

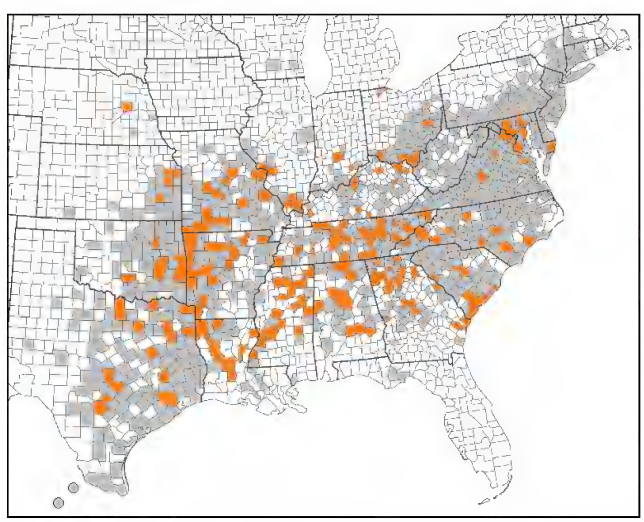

Fig. 4. County distribution of "intermediate-patched" variants (shown in orange).

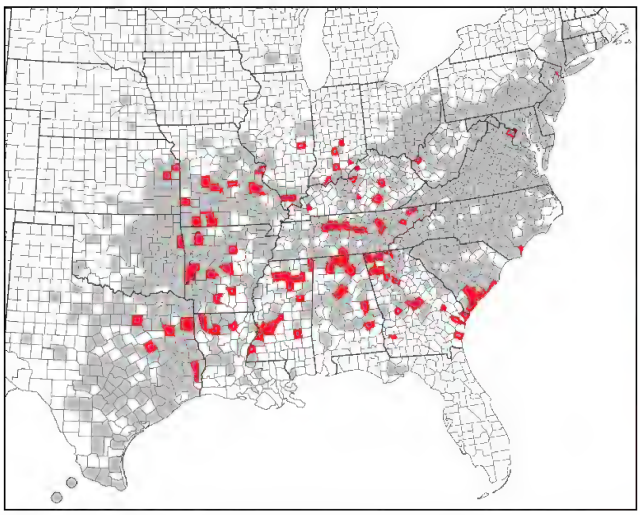

Fig. 5. County distribution of "large-patched" variants (shown in red).

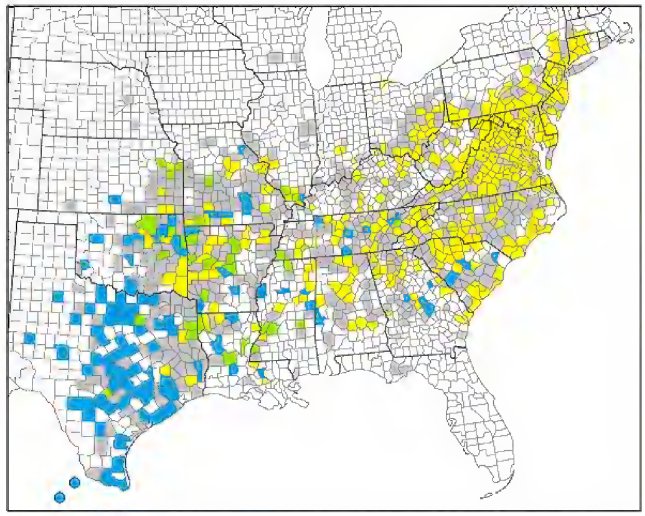

Fig. 6. County distribution of variants with white wing bases (subspecies *texana*) shown as blue; black wing bases (that are considered "not-*texana*") shown as yellow. Green counties indicate BOTH types present.

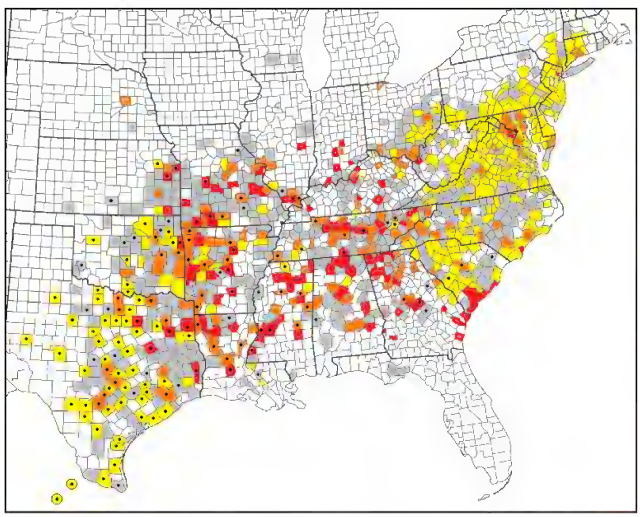

Fig. 7. Composite map showing distribution of maximum orange patch size throughout range of *A. midea*: RED = large patch; ORANGE = intermediate patch; YELLOW = small patch; GREY= additional sight and literature records, including all females; BLACK DOT = white dorsal wing base (*texana*).

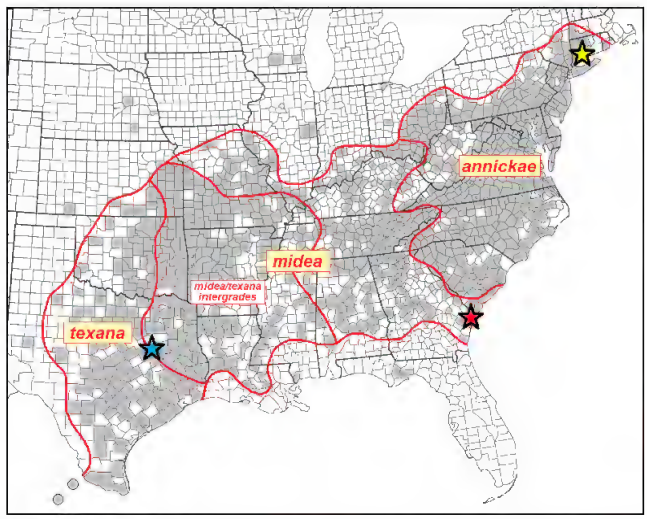

Fig. 8. Generalized ranges of subspecies. Stars indicate type localities: yellow = *annickae*; red = *midea*; blue = *texana*.

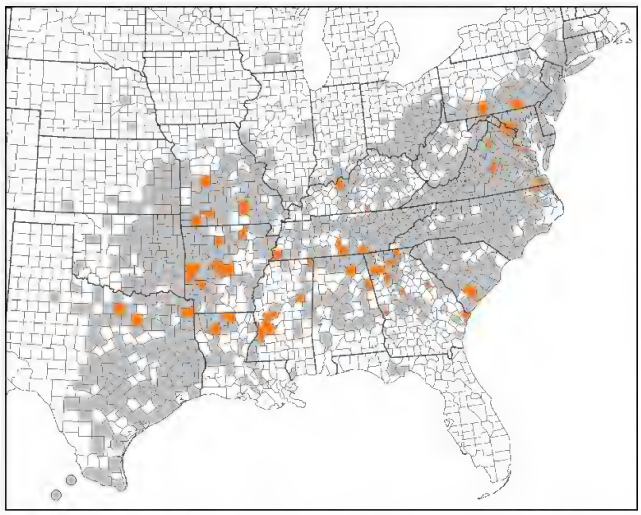

Fig. 9. County distribution of females displaying orange-tinted forewing apex (shown in orange).

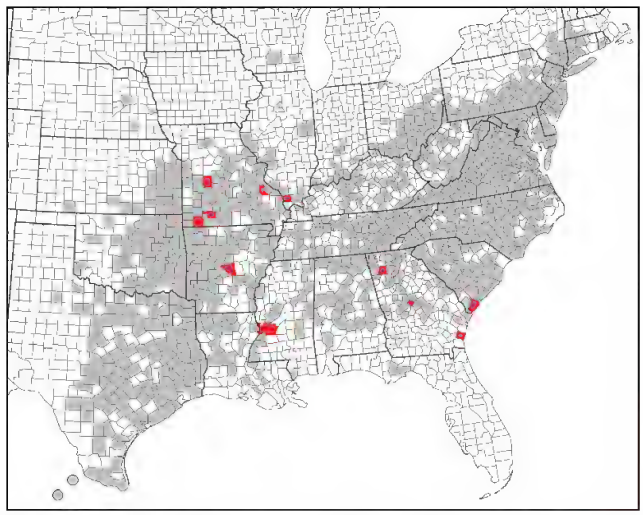

Fig. 10. County distribution of males displaying orange-tinted hindwings (shown in red).

Finally, a sample of male apical orange patch size (**Table 1**) shows percentages of each of the three apical patch variants in different regions of the United States. Percentages and counts are based per county, while some adjacent counties are grouped to produce more reliable results.

State	Location	small patch	intermediate patch	large patch
AR	Polk, Scott Co's.	0% (n=0)	57% (n=8)	43% (n=6)
CT	New Haven Co.	52% (n=12)	48% (n=11)	0% (n=0)
GA	Chatham, Glynn Co's.	0% (n=0)	9% (n=2)	91% (n=21)
GA	Cobb, DeKalb, Fulton Co's.	0% (n=0)	54% (n=13)	46% (n=11)
KS	Johnson Co.	0% (n=0)	44% (n=4)	56% (n=5)
MD	Allegany Co.	100% (n=9)	0% (n=0)	0% (n=0)
MD	Frederick & Montgomery Co's.	100% (n=68)	0% (n=0)	0% (n=0)
MO	Barry Co.	0% (n=0)	20% (n=2)	80% (n=8)
MO	Benton Co.	0% (n=0)	48% (n=22)	52% (n=24)
MO	Christian Co.	0% (n=0)	56% (n=5)	44% (n=4)
MO	St. Francois Co.	10% (n=2)	30% (n=6)	60% (n=12)
MO	St. Louis Co.	0% (n=0)	67% (n=6)	33% (n=3)
MS	Calhoun, Lafayette, Panola, Pontotoc Co's.	0% (n=0)	43% (n=3)	57% (n=4)
MS	Claiborne, Hinds, Madison, Warren Co's.	0% (n=0)	47% (n=40)	53% (n=45)
NJ	Essex & Passaic Co's.	69% (n=18)	27% (n=7)	4% (n=1)
NY	Orange & Rockland Co's.	37% (n=7)	63% (n=12)	0% (n=0)
OK	Garvin Co.	0% (n=0)	100% (n=6)	0% (n=0)
SC	Beaufort, Charleston, Colleton Co's.	6% (n=2)	12% (n=4)	83% (n=27)
VA	Frederick Co.	100% (n=45)	0% (n=0)	0% (n=0)
VA	Fairfax, Loudoun Cos.	98% (n=73)	1% (n=1)	1% (n=1)

Table 1. Sample distribution of male apical patch size showing percentage of each of the three variant forms. Adjacent counties are grouped for more reliable percentages.

CONCLUSION

Anthocharis midea is more accurately described as consisting of a form complex that is difficult to characterize as a traditional grouping of subspecies. Keeping with prevailing concepts, the distribution of the three described and currently-recognized subspecies needed to be better defined, based on the phenotypic characteristics in the four groups shown in the final map (**Fig. 8**). Males primarily fall into two variants, based on the dorsal orange apical patch, and presence or absence of black scales at the base of the wings. Females are indistinguishable to subspecies except by the presence or absence of black scales at the base of the wings.

***Anthocharis midea midea* (Hübner, [1809])** – This is a highly polytypic grouping, consisting of varying sizes of male orange apical-patched individuals. Percentages of localized populations displaying small, intermediate or large apical patches fluctuates widely across the entire region shown here as *midea*. A most interesting finding was that large and intermediate-patched individuals dominate the central region of the species, with small-patched variants being much less frequent than in eastern (*annickae*) or western (*texana*) portions of the species range. The range of ssp. *midea* shown here is considerably larger than has been traditionally considered - just along the southeastern coastal region where large-patched individuals are more frequent (Gatrelle, 1998), but is best defined as the region where the large and intermediate-patched variant forms occur. Males with orange-tinted hindwings show maximum development of dorsal orange coloration.

***Anthocharis midea annickae* dos Passos & Klots, 1969** – The small-patched male variant occurs range-wide, from Massachusetts to Mexico. Subspecies *annickae* is thus best defined as the portion of the species range displaying the small apical patch to the general exclusion of large and intermediate patched males, and with black dorsal wing bases. The range extends from Massachusetts to Georgia and west into the Ohio River drainage.

***Anthocharis midea texana* Gatrelle, 1998** – This subspecies is based entirely on a single character – the presence of white dorsal wing bases. In much of the subspecies' range, males appear similar to subspecies *annickae,* but lack the black wing bases of *annickae.* Toward the eastern portion of the range of *texana*, many male individuals are found, with intermediate and large apical patches. This subspecies then grades eastward into the following grouping:

***Anthocharis midea midea/texana* intermediates** – This region displays the broadest range of polytypic individuals. Male apical patches may be small, large, or intermediate. Adults of both sexes may display either black (*midea*) or white (*texana*) wing bases.

Lastly, females displaying the orange-tinted forewing apical area do not precisely correspond to the above variants. Gatrelle (1998) believed that females possessing the orange-tinted apex are confined to the southeastern coastal region. With further sampling and updated imagery, these have been observed range wide in subspecies *midea* and *annickae*, but have not yet been documented in subspecies *texana*. Orange-tinted females are apparently more frequent within the range of polytypic ssp. *midea* (**Fig. 9**). The documented presence of orange-tinted females centered in the region around the state of Maryland is very likely the result of a greater number of collectors and photographers concentrated in that region. This indicates that orange-tinted females are likely present anywhere within the range of ssp. *annickae*.

It can be concluded that *A. midea* is a highly polytypic form-complex. Nominotypical *A. m. midea* is a polytypic, variable "subspecies", occupying the central portion of the species range. The large-patched males appear more frequently along the Georgia and South Carolina coastal region but also frequently within a patchwork of colonies as far inland as Oklahoma and Nebraska. Subspecies *annickae* is best restricted to the northeastern region where only the small-patched variants occur, to the exclusion of

intermediate or large-patched males (except for rare aberrant individuals). Subspecies *texana* is restricted to the southwestern portion of the species range, where individuals lack the dorsal dark basal scales and males bear small apical patches to the exclusion of intermediate or large-patched males (though aberrants have been documented). There is a very broad area from Kansas to Mississippi where *texana* and *midea* variants intergrade, but might be considered within polytypic subspecies *midea*. In this intergrade region, individuals with light wing bases are more frequent toward the west, and dark wing-base individuals are more frequent toward the east. I propose no changes in subspecies designations, rather suggesting that the concept of subspecies stands to be redefined in the case of *A. midea*, to reflect the distribution of the discussed variant forms.

NOMENCLATURE

Of interest in the study of *Anthocharis midea* are the numerous nomenclatural changes published throughout literature. Many of the following were applied in different combinations or treatments; too many to list here. Following is a simplified synonymy:

[genus] ***Anthocharis*** Boisduval, Rambur, [Duménil] & Graslin (1833)
=***Mancipium*** Hübner, [1809] (preoccupied name)
=***Falcapica*** Klots, 1930 (proposed replacement name)
=***Anthochris*** Cook, 1948 (misspelling)
=***Anthocaris*** auct. (misspelling)
As ***Papilio*** Fabricius, 1793
As ***Synchloe*** Hübner, [1818]
As ***Pieris*** (Godart, 1819)
As ***Euchloe*** Hübner, [1819]
As ***Tetracharis*** Grote, 1898
[subgenus] ***Tetracharis*** Grote, 1898
=***Midea*** Herrich-Schäffer, 1867 (preoccupied name)
As ***Paramidea*** Kuznetsov, 1929
A. midea midea (Hübner, [1809])
=***genutia*** (Fabricius, 1793) (preoccupied name)
=***lherminieri*** (Godart, [1819])
=***flavida*** (Skinner, 1917)
=***medea*** (Leussler, 1938) (misspelling)
A. midea annickae (doe Passos & Klots, 1969)
A. midea texana Gatrelle, 1998

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Gatrelle, R. R. 1998. An addendum to *Anthocharis midea* dos Passos and Klots 1969. (Description of a new subspecies from Texas.) The Taxonomic Report 1(1): 1-5.

Hübner, J. 1806. Sammlung Exotischer Schmetterlinge. First Band. Published by author: 436 pp. [pl. 142, figs. 1-4].

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